Redefining hygiene in practice: addressing emerging health risks in home microecologies

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CERTIFICATE OF ORIGINAL AUTHORSHIP

I, Rachael Wakefield-Rann declare that this thesis, is submitted in fulfilment of the requirements for the award of Doctor of Philosophy in Sustainable Futures, in the Institute for Sustainable Futures at the University of Technology Sydney. This thesis is wholly my own work unless otherwise reference or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

This research is supported by the Australian Government Research Training Program.

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In line with the Institute for Sustainable Futures guidelines, this thesis is a Thesis by Compilation, comprised of both traditional chapters and published journal articles. A list of the articles included in this thesis are included below, followed by a list of other relevant journal publications, reports and conference presentations, and public media.

PUBLICATIONS INCLUDED IN THESIS BY COMPILATION

1. Wakefield-Rann, R., Fam, D., & Stewart, S. (2018). Routine exposure: social practices and environmental health risks in the home. *Social Theory & Health*, 1-18.

2. Wakefield-Rann, R., Fam, D., & Stewart, S. (in press) Microbes, chemicals and the health of homes: integrating theories to account for more-than-human entanglements, *BioSocieties*

3. Wakefield-Rann, R., Fam, D., & Stewart, S. (2018). "It's Just a Never-Ending Battle": The Role of Modern Hygiene Ideals and the Dynamics of Everyday Life in Constructing Indoor Ecologies. *Human Ecology Review*, *24*(2), 61.

4. Wakefield-Rann, R. (2017). More Than Skin Deep: A Service Design Approach to Making the Luxury Personal Care Industry More Sustainable. In *Sustainable Management of Luxury* (pp. 211-231). Springer, Singapore.

5. Wakefield-Rann, R., Fam, D., & Stewart, S. (2018). "Initiating a Transdisciplinary Conversation to Improve Indoor Ecologies. *Human Ecology Review*, *24*(2), 61.

OTHER RELEVANT PUBLICATIONS

Lee, T., & Wakefield-Rann, R. (2018). Design Philosophy and Poetic Thinking: Peter Sloterdijk's Metaphorical Explorations of the Interior. *Human Ecology Review*, *24*(2), 153.

RELEVANT INDUSTRY REPORTS

Report: Mellick Lopes, A., Sofoulis, Z., **Wakefield-Rann, R**., & Yu, Y. (2017). 'Exploring the Practices of Mandarin-speaking Water Drinkers: Research Conducted as Part of the Collaborative Research Project Understanding the Drivers of Public Trust in Sydney Water.'

Report: Dubash, J., **Wakefield-Rann, R.**, Prentice, E., Giurco, D., and Latimer, G. (2018): Chemical Management for Consumer Products – Company Evaluations for Stewart Investors. Institute for Sustainable Futures, UTS (publication awaiting outcome of final negotiations with companies assessed).

RELEVANT ONLINE PUBLICATIONS

Wakefield-Rann, R. (2018) 'Chemical Showers: How Daily Routines Structure Our Exposures to Toxicants.' *Toxic Bodies series*. Engagement: blog of the Anthropology and Environment Society, A Section of the American Anthropological Association: https://aesengagement.wordpress.com/2017/11/21/chemical-showers-how-daily-routines-structure-our-exposures-to-toxicants/

RELEVANT MEDIA INTERVIEWS

TELEVISION

Television interview for The Project New Zealand, focused on chemicals in consumer products in the home, particularly toys, aired on 12/10/2018

PRINT MEDIA

Interviewed for story on the health and environmental sustainability challenges personal care companies are facing when designing their products. By Alejandra Borunda for National Geographic (awaiting publication).

'How environmentally friendly are 'eco' bath and cleaning products?' By Jo Khan for ABC Science: https://www.abc.net.au/news/science/2018-08-08/how-environmentally-friendly-are-eco-household-products/10017734 8/8/2018

'Smiggle, Kmart refuse to pull 'harmful' squishies toys from shelves despite cancer risk' By Alana Mitchelson for The New Daily: https://thenewdaily.com.au/money/consumer/2018/09/03/squishies-smiggle-kmart/ 3/9/2018

DECLARATION BY CO-AUTHORS

In the case of Paper 1, the undersigned agree that the nature and extent of the contributions to the work was as follows:

Co-author	Nature of contribution	Extent of contribution (%)	Signature	Date
Rachael Wakefield-Rann	Lead researcher and author	90	Production Note: Signature removed prior to publication.	11.4.19
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PREFACE

This thesis is written through a commitment to social and environmental justice and change. At the heart of my doctoral (and preceding) research has been a drive to understand the ways that the socio-material arrangements of everyday life produce different patterns of resource consumption and disposal, and their consequent social and ecological impacts. During my Honours research – examining how different epistemological approaches across the social sciences often lead to radically different propositions for interventions to address the problem of unsustainable clothing consumption rates—I became interested in Social Practice Theories and their capacity to shed light on 'inconspicuous consumption': the invisible acts of consumption embedded in everyday practices, associated with issues of infrastructure, interdependence and normal standards (Shove and Warde, 2002a).

My interest in inconspicuous consumption grew through my work outside of academia working in and with the waste industry, as a researcher, community educator, local government officer (devising waste policy and programs), and as a charity 'food rescue' driver. Throughout this period, I became increasingly interested in how communities are made responsible for making changes that are not well enabled, if at all, by the socio-material

conditions in which they are operating. The importance of how responsibility becomes individualised in the context of systems that deliberately work to make certain entities imperceptible, became a central concern for me. Paradoxically, it seemed, a successful waste management system is defined by the extent to which it is invisible to those using it, yet a successful citizen-consumer operating within this system is expected to maintain an active awareness of all the downstream impacts of their consumption choices as they are making them.

It is via this experiential and theoretical grounding that the trajectory of this doctoral thesis was formed. In particular, I perceived a need to further explore the ways that certain agents that are crucial to human and broader planetary health are made imperceptible by socio-material systems. On this basis, I originally proposed to conduct my doctoral research on the issue of plastic waste associated with the global food system. I also initially began this research in a School of Design. Although my background is broadly in Political Science, Geography and Human Ecology (BA/BSc), I chose design for two primary reasons. First, design plays a crucial role in populating the world with services and materials, which play a significant role in how resources are used and what practices are made possible. The second follows Latour's observation that the meaning of design has grown in comprehension and extension. To consider something in terms of design is to acknowledge that particular values and skills and technologies have gone into its creation, "The more objects are turned into things – that is, the more matters of facts[sic] are turned into matters of concern – the more they are rendered into objects of design through and through." (Latour, 2008: 2)

As I delved deeper into this subject, I became aware of a micro-scale of activity and interaction that is transforming ecosystems and bodies in unprecedented ways that belie extant definitions of toxicity and harm. The post-industrial chemicals that have come to populate the everyday lives of all living things, at pace since World War II, are participating in and transforming bodies in unprecedented ways: yet they have not been made broadly perceptible by our socio-material conditions. Simultaneously, I noticed parallels with the

ways that invisible microorganisms have been made perceptible via socio-material conditions that make certain types of pathogenic relations visible, while obscuring essential mutualistic relations between human, microbial and ecological systems. While these remain matters deeply embedded within an expanded conception of design, other epistemological traditions have also been crucial in determining the objects and boundaries of concern that have made some entities, risks and forms of relationality more perceptible than others.

My project was consequently reformulated to examine (in the broadest sense) how contending 'regimes of perceptibility' (Murphy, 2006) shape everyday socio-material conditions that come to shape human bodies, and the more-than-human ecologies we are embedded within. Specifically, I am interested in the socio-material dynamics that constitute indoor ecologies; the environments where most humans in industrialised nations now spend the majority of their lives. Questions of relations at the molecular scale go beyond what is required to adequately understand contemporary risks to human health. They reach back to broader questions of what we believe our world is made of and how our bodies relate to and are mutually constituted by the broader more-than-human ecologies we are part of.

The questions inherent to this project exceed and problematise the boundaries and domains of concern that demarcate traditional disciplinary boundaries. As a result, in the second year of my research I decided to move from the School of Design to the Institute for Sustainable Futures; an institute that specialises in transdisciplinary approaches to addressing complex socio-ecological issues. This thesis does not comfortably conform to the conventions of any single discipline but amalgamates conventions based on the different values they bring to the exploration of this complex cross-disciplinary topic. Moreover, in recognition of the need to make explicit and begin to bridge divergent disciplinary approaches, I also made the unconventional decision to consider the publications included in this thesis as an opportunity to target and connect different disciplinary audiences. Finding new ways to connect diverse knowledge traditions and approaches will continue to be my objective, building on the outcomes of this research into the future.

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GLOSSARY AND ABBREVIATIONS

ABBREVIATIONS	
BPA	Bisphenol A
BPF	Bisphenol F
BPS	Bisphenol S
EDC	endocrine disrupting chemical
PFAS	Per- and poly-fluoroalkyl substances
PCP	personal care product
PVC	polyvinyl chloride

GLOSSARY	
Key Terms	Definition
cleaning practices	Cleaning practices include any act that involves the removal of unwanted substances, such as dirt, or other substances perceived to be unsafe. They also include preventative acts intended to mitigate against the development or spread of pathogens or other unwanted substances.
hygiene	Hygiene is defined in the Oxford English Dictionary (2016) as the 'Conditions or practices conducive to maintaining health and preventing disease, especially through cleanliness'. However, a central argument and focus of this thesis is how hygiene comes to encompass different practices and entities at a given place and time based on cultural, environmental and historical contingencies. For the purposes of this thesis, hygiene and hygiene practices are consequently taken to mean the practices performed wholly, or in part, to maintain health and prevent disease in an environment. This definition encompasses practices such as cleaning a bathroom, but also aspects of meal preparation and personal care, such as bathing, which are based on certain ideas, standards and materials that guide normative conceptions of how cleanliness is supposed to be maintained. Hygiene considerations are also embedded in other practices, such as cooking, which is often accompanied by a series of actions, such as handwashing or wiping benches, that are intended explicitly or implicitly to prevent disease.
micro-species	Micro-species is a category developed for the purposes of this thesis to challenge existing species ontology and collectively theorise microorganisms and post-industrial chemicals. A complete description and justification for the use of this term is included in Paper 2.
microbiome	In the literature microbiome most commonly refers to the collective genetic material of microbiota, but has also commonly been used to refer to the ecology of the microbiota (Turnbaugh et al., 2007)
microbiota	The entire collection of microbes in a certain environment (Turnbaugh et al., 2007)
microecology	Within the field of microbiology, a microecology refers to the ecology of a micro-habitat. Microbial ecologists study the interactions of microorganisms with their environments, with each other, and with plant and animal species (O'Malley, 2016). For the purposes of this thesis, 'microecology' refers to both microbial and non-living entities, such as chemical pollutants, that make up a micro-habitat.

microorganism/ microbe	Microbes are single or multicellular microscopic organisms. They include viruses, bacteria, protists, archae, some fungi and algae (Crespi, 2001)
more-than-human	More-than-human refers to a mode of thinking and theorising about interactions between humans and non-humans that spans multiple disciplines, including human and cultural geography, science and technology studies (STS), environmental humanities, post-humanist sociology, anthropology and others (Maller, 2018). Although defined heterogeneously across these disciplines, more-than-human approaches generally serve to destabilise ways of theorising categories such as materiality, agency, relationality and causality. They do this by drawing focus away from the intentions and agency of humans, to examine the world through the dynamic relations that emerge through complex interactions between multiple human and non-human agents (Phillips, 2014, Whatmore, 2006). More context for these theories is provided in Chapter 4.
post-industrial chemicals	Post-industrial chemicals is a term used to refer to classes of human-synthesised chemicals that have primarily been developed and associated with industrial processes but are now used in a multitude of products and processes. These chemicals have unique properties that mean they have been designated as pollutants in most of the world's ecosystems and animal bodies. Examples of these chemical classes include highly fluorinated chemicals, antimicrobials, bisphenols and phthalates, some solvents, some metals and flame retardants (GSPI, 2016). 'Post-industrial chemicals' are also commonly referred to as anthropogenic or post-natural chemicals (Altman et al., 2008, Liboiron et al., 2018).
social practices	Drawing on social practice theories, 'social practice' is used here to refer to the repeated performance of certain groupings of the meanings, materials and bodily actions that comprise everyday life.
sub-optimal environment	A sub-optimal environment is defined here as an environment that affords sub-optimal conditions for human health based on the research cited into the types of environmental conditions that are supportive of human health. In particular, the health consequences of microbial and post-industrial chemical exposures are considered.

ABSTRACT

I argue in this thesis that dominant definitions and practices of hygiene in Australia must be updated to account for emerging indoor health risks at the micro-scale. Since World War II, new health risks have emerged in indoor environments that have both transformed and challenged notions of environmental health centred on pathogenic germs. The composition of home spaces, particularly in urban areas of developed nations, have been fundamentally altered by the introduction of post-industrial chemicals in everyday products and building materials. Further, the changing nature of building design, cleaning practices and urban life has altered the 'microbiomes' of homes, contributing to a rise in certain types of immune system conditions and resistance to antibiotics.

This thesis is concerned with if and how culturally contingent definitions of hygiene embedded in everyday practices contribute to these emerging health risks in the indoor ecologies of homes. This concern is based on the premise that underpinning operative definitions and practices of hygiene are particular conceptions of the human body and how it interacts with its environment.

I propose that to begin to address these health risks, the everyday practices that are based on limited notions of health and disease must be interrogated. To do this I develop and apply a qualitative research approach that integrates elements of multiple more-than-human research approaches – social practice theory, multispecies ethnography and chemo-ethnography – to investigate how microbes and post-industrial chemicals manifest physically and symbolically in everyday domestic hygiene practices. This approach informed fieldwork, conducted in Sydney, Australia, which examined the home hygiene practices of parents with children under five years old.

Findings from this research highlight some of the ways that chemicals and microbes are assumed to operate in everyday domestic practices. They also provide important insights into

the dynamics of everyday life that influence how hygiene is performed in the home and what risks may consequently manifest. In addition to providing insights into the dynamics of practice that may be contributing to maladaptive indoor home ecologies, this research also points to an urgent need for greater knowledge integration across disciplines concerned with different social and material aspects of indoor environmental health